

Restoration Planning Activity Implementation Plan

Title: Evaluating Orientation Response of Sea Turtle Hatchlings to Physical Cues on Nesting Beaches

Need: Artificial lights visible from sea turtle nesting beaches that alter the natural nighttime environment can disrupt successful orientation of sea turtles to the water (Witherington et al. 2014). Previous projects to reduce these lighting impacts on nesting beaches have focused on removing or retrofitting existing lights on adjacent properties or structures. These activities restore a more natural light environment, thereby reducing disorientation of adult and hatchling sea turtles. While this is an effective strategy to resolve the most deleterious lights, lighting that must remain for public safety and ambient glow from more distant urban or commercial sources can continue to confound sea turtle hatchling orientation to the water. This project will investigate hatchling orientation response to specific cues related to physical and biological beach features to inform future conservation and restoration actions of sea turtle nesting habitat along Florida's developed beaches.

Summary: Sea turtles use a diversity of visual cues – both light and dark – to orient correctly to the sea (Mrosovsky and Shettleworth 1968; Salmon et al. 1992). The visual clues are created by natural physical and biological features of the beach, such as slope and dark silhouettes caused by dunes or landward vegetation (Hirama 2018; Salmon et al. 1992). Altering beach morphology such as steepness of the slope or height of the dunes can change relative patterns of dark and light, thus potentially enhancing correct seaward orientation of sea turtles. For this project, we propose to obtain a better understanding of hatchling perception of and response to visible light using laboratory and field experiments. We will measure the visual landscape (e.g., light and dark areas) on study beaches likely to have artificial lighting issues (identified below: Subtask 2.1). We will also use behavioral assays (hatchling orientation indices and arena assays) to assess the relationship between hatchling orientation and different structural alterations (e.g., installing a light shield or taller vegetation) designed to alter the existing light environment on the beaches identified in Subtask 2.2. This work will address sea turtle restoration goals identified in the Programmatic Damage Assessment and Restoration Plan and Programmatic Environmental Impact Statement¹ and Strategic Framework for Sea Turtle Restoration Activities², specifically:

- Restore injuries by addressing primary threats to sea turtles in the marine and terrestrial environment such as bycatch in commercial and recreational fisheries, acute environmental changes (e.g., cold water temperatures), loss or degradation of nesting beach habitat (e.g., coastal armoring and artificial lighting), and other anthropogenic threats.
- Support existing conservation efforts by ensuring consistency with recovery plans and recovery goals for each of the sea turtle species.

Implementing Trustee: Florida Fish and Wildlife Conservation Commission (FWC)

¹ PDARP: www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan

² Strategic Framework for Sea Turtle Restoration Activities: www.gulfspillrestoration.noaa.gov/sites/default/files/wp-content/uploads/Sea_Turtle_Strategic_Framework_6.23.17.pdf

Period of Performance: 3 years

Project Cost: \$315,000, which includes implementation, trustee oversight, and indirect costs

Description of Work:

Task 1: Laboratory investigations of loggerhead and green sea turtle hatchling visual perspective.

- **Description:** To design appropriate visual cues to trigger a specific orientation response requires determining the “cone of acceptance”, or vertical and horizontal field of view, hatchlings use to assess their surroundings. To do this, we would use standard lab protocols to measure hatchling attraction to light at different vertical angles (30°, 40°, 50°, 60°, and 70°: as in Witherington 1992).
- **Study Site:** We plan to conduct all laboratory experiments in FWC or partner agency facilities adjacent to high density nesting beaches in Palm Beach, Martin, or Brevard Counties. This will ensure we have access to sufficient number of loggerhead and green hatchlings to complete a statistically valid number of trials in a facility adjacent to areas with reliable numbers of nests and hatchlings. Hatchlings will be collected after natural emergence, held in darkness until the assay, and then released the same night in proximity to the beach where they were collected (Witherington and Bjorndal 1991; FWC 2016).
- **Equipment:** Laboratory optic equipment (as in Witherington 1992); materials to create lab test arena; a radiometer; materials for collecting and holding hatchlings.
- **Deliverable:** A summary of the laboratory investigations and a table of results with a description of dimensions to be used to create visual cues in the field to promote correct hatchling orientation toward the water.
- **Schedule:** From July 2021 to July 2022, we would purchase necessary equipment and create the laboratory test arena. Experiments would be implemented during sea turtle hatching season, August 2021 (if the test arena is completed) through October 2022.

Task 2: Design and implement visual cues to influence sea turtle hatchling orientation and assess response.

- **Subtask 2.1:** Collect environmental data to characterize the physical and biological features of study beaches.
 - **Description:** At nest sites, examine hatchling orientation and measure abiotic parameters, such as dune height, berm width, beach slope, and light measurements across the beach, and biotic parameters such as dune vegetation composition, shore-parallel length, and height. Photo document beaches (dune, dune vegetation).
 - **Equipment:** Inclometers; tape measures; DLSR camera with wide-angle lens; measuring tripods; photometers; handheld GPS to collect elevation data.
 - **Study Sites:** We will collect environmental and hatchling orientation data on southwest peninsular and northwest panhandle beaches including Pensacola Beach, Panama City Beach, Clearwater Beach, and Captiva/Sanibel Island Beach as well as on all beaches utilized for field tests described in Subtask 2.2.

- **Deliverable:** A description of the biotic and abiotic parameters and a plan for implementing physical modifications based on specific beach characteristics to test their effect on hatchling orientation.
- **Schedule:** Field measurements, June through August 2021, 2022, 2023, and 2024. The necessary equipment would be purchased and tested in July 2021.
- **Subtask 2.2:** Field tests of hatchling response to physical structures in the visual environment.
 - **Description:** Use information on hatchling visual perspective (Task 1) and study beach environmental and hatchling orientation parameters (Subtask 2.1) to design and implement specific visual cues to enhance loggerhead and green turtle hatchling orientation toward the water. Experiments will be done passively by placing cues in proximity to nests during the final incubation quarter and collecting orientation data (Hirama 2018; Salmon and Witherington 1995) on emerged nests. Arena assays will also be used to test orientation of hatchlings released in proximity to a specific visual cue (silt fence, artificial dune vegetation, or similar structure) compared to no visual cue. Field assessments will be done on beaches exposed to existing lights with known disorientation issues.
 - **Equipment:** Silt fence; artificial plants (or similar materials that would block light), a radiometer (photometer); live hatchlings; specially programmed DSLR camera; tripods; trail cameras.
 - **Study Sites:** We plan to conduct field tests on both the Atlantic and/or Gulf of Mexico beaches to ensure we have access to enough hatchlings and nests to complete the work and to minimize the potential that coastal storms will disrupt the investigations.
 - **Deliverable:** A summary of results including a technical note with design specifications based on specific light levels and beach parameters.
 - **Schedule:** Orientation assays would be conducted from June through August in 2021, 2022, 2023, and 2024. Arena assays would be conducted on the field from July to September 2022, 2023, 2024.

Data Management and Reporting

FWC staff will compile the appropriate data detailed above in the two tasks throughout the calendar year, synthesize the results, and send the data and a draft annual monitoring report to FWC DWH staff within two months of the calendar year ending. FWC DWH staff will QA/QC the materials and coordinate with project staff should any changes be necessary. After any and all identified errors are addressed, the data and report will be considered to be QA/QC'ed. FWC will give the other FL TIG members time to review the materials before making such information publicly available. Implementing Trustee and/or project managers will present to the TIG the results of each task once that task has been completed..

The QA/QC'ed data and reports will be stored in the DIVER Restoration Portal. FWC will submit annual reports to the publicly available DWH DIVER Portal. FWC will prepare a final summary report synthesizing the findings of this Restoration Planning Activity, including

recommendations regarding priorities for sea turtle restoration. The FL TIG will develop DIVER reporting metrics as the restoration planning activity progresses.

Consistency of the Restoration Planning Activity with the PDARP/PEIS:

The PDARP/PEIS (DWH NRDA Trustees 2016) establishes goals to restore and protect sea turtles by 1) implementing an integrated portfolio of restoration approaches to address all injured life stages (hatchling, juvenile, and adult) and species of sea turtles, 2) restoring injuries by addressing primary threats to sea turtles in the marine and terrestrial environment such as bycatch in commercial and recreational fisheries, acute environmental changes, loss or degradation of nesting habitat, and other anthropogenic threats, 3) restoring sea turtles in the various geographic and temporal areas within the Gulf of Mexico and Atlantic Ocean that are relevant to injured species and life stages, and 4) supporting existing conservation efforts by ensuring consistency with recovery plans and recovery goals for each of the sea turtle species (PDARP/PEIS Section 5.5.10.1). This Restoration Planning Activity is intended to address significant informational needs to facilitate future restoration planning and implementation activities for sea turtles. Information gained from this Restoration Planning Activity will directly benefit the Trustees' ability to effectively restore sea turtle populations within the broader, future DWH Sea Turtle Restoration Type projects. Therefore, this Restoration Planning Activity is consistent with the PDARP/PEIS, including the Monitoring and Adaptive Management Framework, as described in Section 5.5.15.2, and the *Strategic Framework for Sea Turtle Restoration Activities*, Module 4: Considerations for Restoration - Monitoring and Adaptive Management Considerations (DWH NRDA Trustees 2017).

National Environmental Policy Act

Introduction

Section 6.4.14 of the PDARP/PEIS considers the environmental consequence associated with activities including, but not limited to planning, feasibility studies, design, engineering, and permitting of conceptual projects. These activities can include a mixture of data collection into historical conditions, modeling of ecological response to the project, conducting surveys, and creating maps and scale drawings of potential project sites. These activities may also include minimally intrusive field activities. Upon review, the federal trustees of the FL TIG find the environmental conditions and NEPA analysis in the PDARP/PEIS current and valid. Therefore, this review relies on the analysis in Section 6.4.14 of the PDARP/PEIS, which is incorporated herein by reference and summarized below.

Summary Review

For purposes of this NEPA review, activities to be conducted can be categorized as "office work", "lab work", and "field work". In this review, data management and reporting activities such as data compilation, data synthesis, and similar activities are considered office work and would not cause adverse impacts to any resource area; therefore, the review focuses on the following lab and field work activities.

Lab work would be conducted in FWC or partner agency facilities adjacent to high density nesting beaches in Palm Beach, Martin, or Brevard Counties and would consist of:

- Conducting studies on visual cues using standard lab protocols to measure hatchling attraction to light at different vertical angles.
- Creating a lab test arena.
- Designing and implementing visual cues to influence sea turtle hatchling orientation and assess response.

Field work would take place on Gulf and Atlantic beaches and would consist of:

- Collecting loggerhead and green sea turtle hatchlings as they emerge from nests for lab and arena studies.
- Collecting environmental data and hatchling orientation information at nest sites on southwest peninsular and northwest panhandle beaches including Pensacola Beach, Panama City Beach, Clearwater Beach, and Captiva/Sanibel Island Beach as well as on all beaches utilized for field tests by measuring abiotic parameters, such as dune height, berm width, beach slope, and light measurements across the beach, and biotic parameters such as dune vegetation composition, shore-parallel length, and height, and photographing beaches (dune, dune vegetation).
- Measuring the visual landscape (e.g., light and dark areas) on study beaches that are likely to have artificial lighting issues that would be identified as part of this study.
- Conducting passive beach studies as hatchlings emerge from nests and arena assay tests to assess the relationship between hatchling orientation and different structural alterations (e.g., installing a light shield or taller vegetation) designed to alter the existing light environment on the beach.

The Final PDARP/PEIS determined that some planning activities would cause minor, direct, short-term impacts through associated fieldwork. Adverse impacts could include disturbance from temporary installation of silt fencing or artificial vegetation to human presence, resulting in short-term, minor adverse impacts to wildlife. These impacts would be localized to the data collection locations.

The PDARP/PEIS states that temporary impacts on the biological and physical environment could include short-term, temporary disturbance of habitats and species, minor emissions from equipment and vehicles, and minor disturbance to terrestrial, estuarine, and marine environments. During some field work activities, some individuals of protected species, such as sea turtles, could alter their behavior or flee the area. Hatchlings would be allowed to emerge naturally into restraining cages and then collected and transported to the lab or to the beach study site (arena). After experimental trials, hatchlings would be released from the beach the same night they emerge. Hatchlings would be placed a short distance from the shoreline and allowed to crawl into the water as required in the FWC Handbook (FWC 2016).

The PDARP/PEIS states that in cases where the appropriate permit or other environmental review has been secured (e.g., for photographing, handling, or disturbing listed species) or determined to be unnecessary (e.g., certain minor, temporary disturbance of marine mammals that does not constitute harassment), minor adverse impacts to certain protected and managed

resources also could occur. The proposed work would be covered under the existing ESA Section 6 Cooperative Agreement between FWC and USFWS (USFWS and FWC 2018).

Groundwork to simulate a dune or vegetation landward of the nest would be minimal as silt fence would act as dune or artificial plants may be staked into the sand – similar to stakes used to mark turtle nests. None of the project activities will take place in the dune habitat and access to the beach will be through defined access points. These activities are not expected to affect cultural resources.

Conclusion

All impacts fall within the analysis provided in Section 6.4.14 of the Final PDARP/PEIS; therefore, no further NEPA analysis for these activities is required. No long-term adverse impacts would occur as a result of the sea turtle planning activities. Only short-term, negligible to minor adverse impacts could occur. Beneficial impacts would result from increased understanding about sea turtle hatchling behavior and the implications for sea turtle restoration planning. Once sea turtle hatchling behavioral information is developed, the TIG may propose, in future restoration plans, implementation of sea turtle nesting projects, at which time NEPA analysis and other environmental compliance requirements would be addressed for implementation activities. Monitoring and adaptive management plans would also be developed at that time. Although information gathered may inform future project alternatives, the outcome of these studies does not commit the FL TIG to future actions.

Compliance with Other Environmental Laws and Regulations

The FL TIG has completed compliance with all applicable local, state, and, federal laws and regulations relevant to this restoration planning activity, as described below.

DOI has determined that no further Endangered Species Act (ESA) evaluation is needed for this restoration planning activity, since it will be implemented by FWC under an existing Section 6 Cooperative Agreement, which allows authorized employees or agents to take threatened and endangered species when acting in the course of official duties. Furthermore, DOI has determined that Bald and Golden eagles are not present in the action area and all standard conservation measures or best management practices will be followed for migratory birds that could be present near sea turtle nests.

DOI has determined that the project has no potential to affect historic properties, and that no further of the review of project under Section 106 of the National Historic Preservation Act is warranted for this restoration planning activity unless further information becomes available.

NOAA has determined that no federal statutes under its purview (i.e. ESA, Essential Fish Habitat, and the Marine Mammal Protection Act), are applicable since all the activities

associated with this restoration planning activity are being implemented above the Mean High-Water Line.

The physical modifications of the beach surface (silt screen or artificial plant installation) are exempt from Florida Department of Environmental Protection Coastal Construction Control Line permit requirements because small, temporary activities that do not involve significant modifications of the beach surface do not require a permit.

The FL TIG has determined that the proposed activities are covered by the Coastal Zone Management Act (CZMA) consistency determination for the Final PDARP/PEIS. As described in Section 6.9.4 of the Final PDARP/PEIS, the Federal Trustees recognized that there are reasonably foreseeable effects on coastal uses resources that would flow from the adoption of the Final PDARP/PEIS, which included preliminary phases of restoration planning. Accordingly, the federal Trustees evaluated those reasonably foreseeable effects of the PDARP/PEIS for consistency with the federally approved coastal management programs in all the Gulf Coast states, including Florida, and submitted a consistency determination for the PDARP/PEIS for state review. Florida reviewed the Trustees' consistency determination and concurred with that determination (DWH NRDA 2016).

Federal environmental compliance responsibilities and procedures follow the Trustee Council Standard Operating Procedures (SOP), which are laid out in Section 9.4.6 of that document. Following the SOP, the Implementing Trustees will ensure that the status of environmental compliance (e.g., completed vs. in progress) is tracked through the Restoration Portal.

Documentation of regulatory compliance will be available in the Administrative Record that can be found at the DOI's Online Administrative Record repository for the DWH NRDA (<https://www.doi.gov/deepwaterhorizon/adminrecord>). The current status of environmental compliance can be viewed at any time on the Trustee Council's website: <http://www.gulfspillrestoration.noaa.gov/environmental-compliance/>.

References:

DWH NRDA Trustees. 2016. *Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan (PDARP) and Final Programmatic Environmental Impact Statement (PEIS).

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